

## Garu and Chandan.

BY H. N. RIDLEY.

Incense woods have always been highly prized by Orientals from the earliest years, and a good deal has been written about them in various works, so that it is rather surprising to find how very incompletely the trees producing them are known. The two most important and interesting ones in the Malay Peninsula are the Garu or Calambac and the Chandan. Both of these belong to the genus *Aquilaria*, of the order *Thymeleaceæ* and as neither have been adequately described, I will give descriptions of the trees in dealing with each wood.

GARU OR GAHARU, KALAMBAK, TUIKARAS.

*Aquilaria Malaccensis* Lam. Dict. i. 49. Ill. t. 356. Dec. Prodr. ii. 59. Kurz. For. Flor. ii. 336. Hook. fil. Flor. British India v. p. 200. *A. ovata* Cav. Diss. vii. 377. t. 224. *A. secundaria* Dec. lc. Rumph. Herb. Amboin. ii. 34 t. 10. A tree 70 to 80 feet tall with whitish rather smooth bark. Leaves elliptic acuminate glabrous when adult, sub-coriaceous thin 3 inches long  $1\frac{1}{2}$  wide, light green shining, nerves about 13 pairs not much raised beneath and quite invisible on the upper surface, young leaves and shoots silky. Flowers in short axillary silky panicles of umbels an inch long with two or three umbels of about 10 flowers on each, on slender pedicels  $\frac{1}{8}$  inch long, lobes 5 hairy oblong obtuse recurved, as long as the tube, alternate lobes smaller than the others. In the mouth of the tube and projecting conspicuously beyond it are ten oblong silky scales. Stamens 10, projecting beyond the tube, filaments free from the tube for some way, anthers obovate. Pistil cylindric hairy much shorter than the tube, tipped with a thick conic stigma. Fruit a flattened obovate woody capsule, green and fleshy when fresh, woody when dry, 1 inch long and  $\frac{3}{4}$  inch wide, walls very thick,  $\frac{1}{4}$  inch through, splitting into two valves with a partition down each, and containing one seed in each cell. Seed ovoid globose orange covered with red hair.

When the capsule splits the seed hangs out by a slender thread the funicle.

Occurs in dense forests in Singapore, Garden Jungle, Kranji. Johor. Malacca, Bukit Bruang, Sungei Hudang, Brisu. Negri Sembilan, Tampin, Bukit Sulu. Pahang, Kwala Luit. Penang Waterfall, Balik Pulau. Borneo, Labuk bay. Sumatra, near Kebang, Turabangi River, Lampongs. Banka near Jebus (Miquel in Flora of Sumatra).

The plant in the garden jungle produced remarkably small more rounded capsules  $\frac{1}{2}$  an inch long so that I at first took it to be a distinct species but as the leaves and flowers were absolutely identical I conclude it is but an abnormal form.

There seems to have been much confusion between this species and the Indian *Aquilaria Agallocha* Roxb. which is well figured by Roxburgh and Colebrook in the Transactions of the Linnean Society xxi t. 21. This tree certainly closely resembles our plant, but apparently attains a greater size; the nerves of the leaf are more numerous; the umbels of flowers are solitary and not paniced, and contain 20 to 40 flowers in each. The flowers are nearly twice as big, with ovate obtuse spreading lobes, the scales at the mouth shorter and not or only just projecting beyond the mouth, and five in number, the pistil is flask shaped with a distinct style narrower than the ovary and a large capitate stigma which reaches up to and fills the mouth of the tube. The capsule as figured much resembles that of the Malacca species, but is described as clavate turbinate and vilous like a peach. Roxburgh states that capsules and young plants sent by Farquhar from Malacca in 1851 quite resemble those of the Indian species. Hooker, however, says that the figure of the fruit is quite like that of *A. Malaccensis* and very different from that of the Bhotan and Khasiya species, *A. agallocha*, which he describes as oblanceolate acuminate thinly coriaceous and glabrous. However this may be it is clear I think that the Malacca plant is very distinct from the Indian one. The only figure of the flower of the Gaharu I have seen published is a very good one in Baillon's History of Plants, vol. vi, p. 108.

The valued drug is obtained from the centre of old trees, and the Malay garu hunters pretend to be able to see from the

outward appearance of a tree whether or no it contains any. The greater number of trees do not. The ordinary wood of the tree is soft and white and seldom used for any purpose, but apparently from some injury or other certain trees are hollow and contain a certain quantity of the dark brown resinous wood with its peculiar odor. An account of the ceremonies used and the names of varieties of Garu was published by Mr. Bland in *Journal No. 18* pages 359 to 361, which is quoted by Skeat in *Malay Magic* p. 206, with further additions and notes on the subject. Eight varieties are mentioned including the Chandan, which, however, is from a different tree and perhaps some of the others are not strictly speaking Garu, but it is admitted that there are several distinct varieties, of very different values. The early history of Garu is interesting although it cannot be certainly known to which of the two kinds the early records refer. It is always considered that the lign-aloes of the Bible, Ahalim, was Garu or Eagle wood, but the passages in which it was mentioned seem hardly to bear this out; thus Balaam refers to "the trees of the lign-aloes which the Lord hath planted," which if Garu he could have never seen, and though it is also referred to as being used for scenting the clothes and body in several passages, it does not appear as an ingredient in incense, for which it would be more likely to be used. The earliest definite mention of it appears to be by the Arab physician Abu Ali Al-hosain (commonly known as Avicenna), who lived from 980 to 1037. He mentions two kinds, Xylaloes and Agalugen. The first word Xylaloes is a Greek form of *Lignum Aloes*, which is a perversion of the Arabic *Alud* (literary the wood), which was modified into aloe wood and so *Lignum Aloes*. The first good account of the Garu is that by Garcia de Orta, who visited Malacca about 1534. He gives its name as Garo, and the best kind as Calambac, and states that it comes from Malacca and Sumatra whence it is brought by the Chinese, and is not as some persons supposed drifted down the rivers from paradise whence its old popular name paradise-wood. He obtained twigs and leaves from Malacca but was unable to get fruits or flowers on account of the difficulty and danger of daily observing the trees, because tigers frequently prowled about there. He states also that the natives of Malacca used to repurge the Garu before

selling it, perhaps he found them adulterating it, as they do to this day. Mr. Bland's varieties are named Chandan, Tandok, Menjulong-ulong (Jenjolong in Selangor according to Skeat, is this Julong-Julong, *Agrostistachys longifolia* Benth?), Sikat, Sikat Lampam, Bulu Rusa, Kemandangan, Wangkang, to which Skeat adds Garu Isi Kang Tua, Garu Tutor, Garu Dedap, Garu Kundur, and Garu Akar. The last four of these are said by Skeat to be useless for market purposes and it may be doubted whether the six last in Bland's list are derived from any *Aquilaria* as the wood of most is described as whitish or yellow, fibrous and light. Perhaps the Garu Akar of Skeat's list is Getah Gaharu (*Willughbeia coriacea*). Chandan is a distinct tree but I have seen typical specimens of Garu called Chandan also. There are several other jungle trees which produce incense wood besides the Aquilarias, among them *Acronychia laurifolia* (*Rutaceæ*) the Mentua Keminiyan. The Garu tree is called by the Malays, Karas, Tuikaras, Tengkaras, Kakaras. Skeat also gives Tabak or, long Tabak as a name used by the Sakais and also as the Pantang Gharu word of the Pawangs. Pomet (*Histoire des Drogues*) gives also the word Tambac, as a name for the drug, which may be the same word.

The history of the popular names for the wood is curious. The earliest name is the Hebrew Ahalim, which is probably connected with the Agalukhi of the Arabs, whence Agallochon of the Greeks and Romans. Hence comes the name Agel wood, Eagle wood, the Portuguese Pao de Aquila, and the genus name *Aquilaria*. It was also called by the Arabs Ud (wood), or Alud, hence Aloe-wood, Lignaloos, which so confused the early druggists that they thought the Aloe-wood came from the plant which produced Aloes. Garu is from the Sanskrit Aquaru. Kalambak is the name commonly given by Malays to the best class of Garu. Rumph derives it from Kilam or Hokilam, the Chinese name for the tree, and Bac, which means knots or buds. Loureiro gives Chinhiam and Manhiam as Cochinchinese for the plant. Favre gives as connected words Halombak (Battak), a sort of wood of which they make beers, and Kalamba (Macassar), which is evidently a mere form of Kalambac. Miquel says it is called Halim in Sumatra. Another old name for Garu was Paradise wood, because it was supposed to be drifted down rivers from Paradise.



Rumph in the Herbarium vol. xi gives a long account of the Garu, with a figure of the Malacca plant. He distinguishes two, *Agallochum primarium* Calambac, and *Agallochum secundarium* Garo. The first was obtained from Tsjampoa (Chiampa) in Eastern Cochin China and Siam, where it is called Kilam or Hokilam. What the plant that produced this is uncertain, as no one of late years has procured any specimens of an *Aquilaria* from Cochin China or Siam. Loureiro in the Flora Cochinchinensis gives very insufficient descriptions of *Aloexylum Agallochum*, a plant of which he got some battered scraps from the highest mountains of Cochin China near the great river "Lavum" which flows between this kingdom and Laos, and of *Ophispermum Sinense* (evidently a species of *Aquilaria*) of which he does not give the locality. This region has been so little explored by botanists that it is not to be wondered that the plant whatever it is has not been recovered. Marco Polo also mentions that Ziamba (chiampa) abounds in lign-aloes of the *Agallochum secundarium*, or Garo. Rumph gives two forms *Agallochum coinamense* the Garo Cominyan (Gharu Kemeniyan) which comes from Malacca, the islands of Johore, Bintang, etc., and especially Billiton. There are three varieties Garo Capalla or Garo Tingelam; Garo Ramas or Tengga-Tengga and a cheaper kind, Garo Eckor, (is this last Skeat's Garu Akar?) The best kind is found in the region inhabited by the forest people "Bunoang" (Orang Benua). Around Malacca also he says is found a kind called Garu Masang (Musang) which inflames the eyes. This is probably the wood of *Excoecaria Agallocha* (Euphorbiaceae) which is a common poisonous sea-shore tree. It is perhaps noteworthy that Garu is not mentioned as being derived from India proper till comparatively late. Pomet mentions that it was sent to Europe from Calcut. Marco Polo states that Java minor (Sumatra) contains lign-aloes.

In very early days in Europe the Garu wood was used internally for colic according to Paul Aegineta in 1531 and it is still used for the same complaint and for malaria by Tamils here. Rumph recommends it for strengthening the heart, stopping palpitations, oppression of the chest, and cardalgia. Pomet in the *Histoire des Drogues* published in 1694 says it has no use in medicine as far as he knows except that it is very aromatic

He gives a picture of the tree which bears no resemblance to anything in particular. Its greatest use has always been for fumigating and it is highly valued by Orientals for ceremonial purposes. Imitation gharu is often made and sold; pieces of decayed brown wood being scented with incense till they retain the smell long enough for selling purposes. In about a month the scent disappears. Rumph mentions this fraud. He says the wood is put into a pot with some shavings of Calambac and kept it closed for a month so that the smoke may not escape, and it will last scented for two or three months. The present value of good Garu is four hundred dollars a picul.

#### CHANDAN.

This tree I heard of as distinct from Garu some years ago but could not get any information about it. The name is absolutely the same as the Indian vernacular for sandalwood, *Santalum album*, but it was clear that this plant did not grow here. While on a botanic expedition in Batu Pahat this year I met with the plant on Bukit Pengaram in dense forest at an altitude of nearly 1000 feet. An old Malay who was with me commenced chopping at a small tree and on my inquiry why he did so he said it was a Chandan tree. There were no fruit or flowers on it but I obtained leaf specimens and portions of the inner wood which on being burnt gave out an aromatic odor somewhat like that of Garu, but distinct. The Malay said that the tree was not old enough to produce good Chandan, and that there was little to be met with in that part of Johor. From the foliage I identified it as an *Aquilaria* of which I had in the herbarium flowering specimens without locality, Kayu Chandan, by Murton, and fruiting ones collected by a plant collector at Kranji in Singapore. It is referred to in my list of Singapore plants as *A. grandiflora* Benth., but on comparing the specimens with the description of that plant I conclude it is quite distinct and propose to call it *Aquilaria hirta* n. sp.

*Description.* A slender tree about 30 feet tall, and four inches through, with whitish rather smooth bark,  $\frac{1}{8}$  inch thick. The shoots and young twigs covered with silky hairs. Leaves alternate 3 to 6 inches long  $1\frac{1}{4}$  to  $2\frac{1}{2}$  inches wide, elliptic or elliptic ovate acute, coriaceous with a thickened edge glabrous,

and very smooth above, beneath covered with hair especially on the midrib, nerves about 18 pairs almost or quite invisible above, petiole less than  $\frac{1}{4}$  inch long hairy. Flowers in peduncled cymes axillary silky, peduncles  $\frac{1}{4}$  inch long covered with silky hairs. Pedicels stout  $\frac{1}{4}$  inch long, tube of the flower as long cylindrical, lobes five ovate much shorter than the tube, silky outside, a thickly silky ring in the mouth at the back of the stamens and barely longer than the mouth of the tube. Stamens ten, anthers oblong nearly sessile in the mouth of the tube, 2 celled apex below bifid, filaments adnate to the tube for their whole length, distinctly elevated hairy. Pistil oblong hairy, much shorter than the tube, dilated above, stigma conic. Fruit with the persistent perianth much enlarged, half an inch long, capsular, flattened pear-shaped with a long narrow base dilated at the end,  $1\frac{1}{2}$  inch long pubescent grey when dry, grooved down each face and  $\frac{1}{2}$  an inch wide at the widest part, thinly woody two valved with a partition along each cell. Seed  $\frac{3}{8}$  inch long ovoid cordate with the funicle  $\frac{3}{4}$  inch long conic at the base and tapering into a filament. Dense woods Singapore, Kranji; Johor, Bukit Pengaram, Batu Pahat.

The species belongs to what was originally made a distinct genus under the name of *Gyrinopsis*, differing from the typical *Aquilarias* in its long-tubed flowers. In this it is allied to a Philippines species known as *A. Cumingiana* but it differs from that in the hairiness of its leaves. The hairiness of the back of the leaves distinguishes the species from any others yet described, in all of which the leaves when full grown are quite smooth. The flowers are silky within and without. The scales in the mouth of the tube are represented by a thickened densely hairy ring between the anthers and the lobes of the flowers. The tube of the flower is also covered thinly with silky hairs. The pistil has a narrowed base and is rather abruptly dilated above; this narrowed portion perhaps corresponds to the stalk of the pistil in *Gyrinops*, the ovules being in the slightly dilated portion of the upper part. The tree as has been said is much smaller than the Garu. When cut down, however, it is seen that the centre of the wood (more than half of it) is of a dusky blackish grey, the sapwood being white. This centre is the aromatic portion.

A list of the known species of *Aquilaria* with their distribution may be useful.

- A. agallocha* Roxb. India—Eastern Himalayas from Bhutan to Martaban.  
*A. malaccensis* Lam. *A. ovata* Cav. *A. secundaria* Dec. Malay Peninsula from Penang to Singapore; Bintang, Borneo, Sumatra.  
*A. microcarpa* Baill. Borneo.  
*A. ophispermum* Poir. *A. chinense* Spring. *Ophispermum sinense* Lour. Cochin China.  
*A. grandiflora* Benth. Hongkong.  
*A. hirta* Ridl. Malay Peninsula.  
*A. cumingiana* Dec. Philippines.

#### EXCLUDED SPECIES.

- A. bancana* Miq. *A. macrophyllus* Miq. Both *Gonystylus*.  
*A. pentandra* Blanco. A Philippine plant quite indeterminable and certainly no *Aquilaria*.

NOTE.—The *Gonystylus* is stated by Miquel to be called Garu Anteru by the natives of Sumatra, and to be used for the same purpose. The Garu champaka (*Agallochum spurium*) of Rumph appears to be this plant. He says it gives a false Garu. *Gonystylus Maingayi* is not rare here. I have never heard of its producing any incense wood, nor have I ever heard any native name for it.

#### PAHANG CHANDAN.

*Wikstroemia Candolleana*, Meisn.

Mr. W. D. Barnes, who made an interesting collection of plants on Bukit K'luang Terbang in the Gunong Benom range in Pahang last year, obtained among other specimens, flowers fruit and leaves of a plant supplying Chandan. With them he sent a portion of the stem of the tree. This plant proved not to be an *Aquilaria* at all, but *Wikstroemia Candolleana* Meisn., a very different looking plant but belonging to the same order *Thymeleaceæ*. It is quite a small tree about 6 to 10 feet tall, with a

light coloured thin bark and white sapwood, the centre being of a greyish black, and resembling that of the *Aquilaria hirta*. The twigs are slender, the leaves opposite ovate to ovate lanceolate acute with short petioles, the racemes of small yellow flowers, terminal gradually increasing as the flowers open and fall, at length over an inch long and very slender. The flowers  $\frac{1}{4}$  inch long, tubular. Fruit a small red drupe. It occurs in Perak on Gunong Hijau, also on the sea-coast at Kamposa, in Kelantan, and on Kedak Peak, and in Java. It is typically a mountain plant growing at an altitude of about 4,000 to 5,000 feet. There are two other species in the Malay Peninsula, viz. *W. Indica* Mey, and *W. viridiflora* Meisn., both small. *W. ovata* C. A. Mey, of the Philippines, is said by Blanco to produce an aromatic resinous wood.

Mr. Barnes says "The scented wood occurs very irregularly. The largest trees on the hill were saplings only of about 4 inches diameter and frequently without a trace of dark wood near the ground, though it might occur through a couple of feet or so higher up, also *vice versa*. The dark wood was always in long pieces but not always concentric with the tree. Many saplings contained none at all. It may interest you to know that the only proper way to treat chandan when you get it is to cut away the white wood and wrap up the valuable dark wood in Lobak leaves; (probably those of *Susum anthelminticum*); no others should be used. Chandan is of three kinds and grows to one foot through at very most.

- (1) Daun halus dan putih (*Wikstrœmia Candolleana*);
- (2) Batang hitam daun seperti daun tanjong;
- (3) Daun kasar seperti gaharu.

Garu, he states, is of only one kind, and grows up to 2 feet in diameter. Bland also states that the Chandan tree differs from other garu trees in having a maximum diameter of  $1\frac{1}{2}$  feet and very soft sapwood. He states that of the varieties he mentions in his list, Chandan and Tandok are the most valuable. "Chandan is oily, black, glistening. It sinks in water." A specimen of "Chandan" from Pahang sent by Mr. Machado closely resembles garu. It is dark, hard, deep brown, exuding slowly drops of deep brown oily resin. Malays who have seen it call it Garu.



There is evidently much confusion in the use of the name Chandan among the Malays, and there are evidently yet more incense woods in the Peninsula of which the origin is not yet known. Those who have the opportunity of getting specimens of these would do well to secure them in order that we may discover what the plants are.

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## Calogramma festiva Walk.

BY H. N. RIDLEY.

This handsome and widely distributed moth is a great pest in our gardens on account of the damage its caterpillars cause to *Crinums* especially *C. asiaticum*. I can find, however, nowhere any description of the larvae, so that it may be well to describe the life history of it as far as I can. The eggs are very small, white, bunshaped, with numerous regular grooves and ridges from the top downwards, finely reticulate with circular reticulations. The moths (in captivity) laid about 40 all close together. The young caterpillars are nearly smooth with a black head, the body marked with fine black and white alternate lines, a transverse black band on the fourth segment and two black spots on the last segment but two, belly and legs pale reddish. They feed in rows on the epidermis of the leaves of the *Crinum* or on the fruit. As they grow larger they separate and attack chiefly the bases of the leaves and central shoot, quite spoiling the appearance of the plant but rarely killing it. The full-grown caterpillar is an inch and a half long and very thick, smooth with a shining chestnut head, body black above with undulating white streaks running along the back and a central ochreous one. A velvety black bar runs across the fourth body segment, an ochre coloured band runs along the side above the spiracles. The spiracles are black with a white spot behind each; belly dull cherry red, fore legs black, the others dull red with a black spot above each foot. It is